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A New Genus of Searsidae from Japan

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Through the kindness of Prof. Tokiharu Abe the writer was offered the loan of a rediscovered specimen in the collections of Tokyo University that had originally been tentatively identified by Tanaka as *Bathytroctes rostratus* Günther. This identification was until recently quite generally applied to *Searsia* as well as several related genera and species. According to our present knowledge of the classification of these fishes, however, the Tokyo specimen proves to be the type of a new species and genus of unusual interest, occupying a unique position both within its own family and also in regard even to related families. A special account of this new genus and species would therefore seem in order. For the general classification of the family Searsidae and the related Alepocephalidae, see Parr, 1951.

Sagamichthys, new genus

Squamation extends forward over the entire head, including cheeks and gill covers, to a line across the snout between the tops of the ascending rami of the premaxillaries. Only the point of the snout beyond this line, and an oval transparent area above the pineal, free of scales. All the scales of the head and of the nape, forward of a band extending across the back between the tops of the gill openings, are imbricated in reverse, with the posterior scale overlapping the scale before it, so that it is the anterior and not the posterior portion of each scale that is exposed. Shoulder organ well developed. No other open dermal pits in shoulder region, outside of the lateral line. Lateral line scales not enlarged, but lateral line pores on the average only at about every second scale, so that the total number of pores is only about one-half (about 50), or less, of the total number of scales (about 100–110) in a longitudinal series above the lateral line. The ventral surfaces of head and body with very conspicuous and well-

defined luminous organs, agreeing in form and arrangement with those of *Searsia* (see discussion of the genus, below).

Premaxillaries strong but short, forming only about one-third, or less, of the edge of the upper jaws, with a single series of moderate teeth but no forward-directed tusks in front. Lower jaw with a single series of small teeth in the normal position along the upper edge, and with a short additional series of slightly smaller teeth arising from a welt-like ridge on the outer surface of the anterior part of lower jaw, well below the normal dentition. A pair of slender, fairly long teeth on vomer. A short, curved series, or oval patch of similar teeth anteriorly on each palatine. Maxillaries with numerous minute teeth in a long, single series. Two well-developed supramaxillaries.

Head moderate. Snout short, blunt, not prominent. Nostrils very small. Orbits moderate, subcircular. Interorbital space wide. Gill slit rather low, entirely within the lower two-thirds of the height, with the upper posterior end of operculum below the middle of the height. Gill cover virtually without dermal margin beyond the bones, its edge extending very obliquely downward and forward from the operculum. Operculum narrow and long, its upper margin descending obliquely from the attachment to the hyomandibular, the lower margin approximately parallel with the upper. Operculum has three long, straight, diverging ribs across the upper portion, and an unequal pair of smaller ribs following the angular contour of the lower anterior portion. Suboperculum long, slightly oblique, subtriangular, with a knob-like thickening, rather than a rib, on the anterior outer surface. Interoperculum fairly large and largely exposed beyond the preopercle, which is subvertical, of only moderate width, its outer ridge only gently curved, rather than angulate.

Six branchiostegals, the upper three wide, plate-like, the width of the uppermost more than 1.5 per cent of L. Gill rakers long, slender, moderately numerous, about 25 in outer arch.

Stomach siphon-caecal to caecal. Intestine moderately convolute. Anus immediately in advance of anal fin. Pyloric caeca large, simple (or divided immediately beyond their base), about 15 by distal count.

Pectorals moderate, but strong, of normal shape (elongate) with about 14 rays. Ventrals inserted slightly but distinctly behind the middle of the length without caudal, with about nine rays. Dorsal and anal fins subequal, with about 17 rays each. Origin of dorsal fin distinctly in advance of the origin of anal fin, but much closer to the vertical from the latter than to the vertical from the insertion of the ventrals.

Body form slender, only moderately compressed. Free caudal peduncle long and strong. Muscular abdominal body wall quite thick, approximately as in *Searsia*.

In *Lepogenys*, of the Alepocephalidae, an apparently discontinuous squamation consisting of relatively few large scales is present on the cheeks and on the upper opercular bones. But neither among the Alepocephalidae nor among the Searsidae, to which the new genus belongs, has anything been observed that even approaches the continuous, complete, and uniform squamation of the head seen in *Sagamichthys*. This feature alone therefore sets the new genus entirely apart from all other members of the same, and also of the most nearly related, family.

Although the uniqueness of the genus is also confirmed by several other features, such as the reversed imbrication of the scales on head and nape, its place among the Searsidae is also exceptionally well demonstrated, particularly by the development of the luminous organs. The type genus, *Searsia*, is characterized, among other things, by a number of quite well-developed and fairly conspicuous luminous organs, some of which are of a shape only seen in this, and in closely related, genera, and all of which occupy very well-defined and constant positions. Similar organs in exactly the same positions are also found very conspicuously in *Persparsia taaningi* and, less conspicuously, in *Holtbyrnia polycoeca*. These organs are the following:

A single, median, *gular* organ, situated ventrally immediately behind the symphysis of the lower jaw. A midventral *jugular* organ situated slightly in advance of the vertical from the pectoral fin bases. This is present in the form of a single, small, round organ in *Persparsia*. It has not been found in *Searsia* or *Holtbyrnia*. In *Sagamichthys* it is very conspicuous and well developed, in the form of a transverse linear organ similar to the thoracic organ. The *thoracic* organ is present in all the species mentioned in the preceding paragraph. It is situated ventrally, somewhat behind the pectorals. In *Persparsia* it takes the form of a transverse series of three separate, round to oval organs. In *Searsia* and in *Sagamichthys* it forms a continuous, linear, transverse organ. The *abdominal* organ in *Persparsia* consists of two separate photophores, arranged transversely a short distance in advance of the ventral fin bases. In *Searsia*, *Sagamichthys*, and *Holtbyrnia polycoeca* it is a single, linear, transverse organ, in the same position. The *interventral* is a single median photophore, between, or slightly in advance of, the anterior ends of the ventral fin bases. It is probably present in all the related forms, but not

always easy to detect on all specimens. It is quite conspicuous in *Sagamichthys*. A single, midventral, *preanal* photophore is quite conspicuous in *Persparsia*. It seems to be absent in all the other forms, including *Sagamichthys*. The *precaudal* is situated at the beginning of the ventral procurent rays of caudal fin. In *Sagamichthys* it is a short transverse bar, which is also the common form in *Searsia*. But in many specimens of the latter, and in *Persparsia*, it is shortened so as to become merely a round median organ. In other specimens there are sometimes indications suggesting that it may represent a coalesced pair of contiguous photophores. Above the midventral series the following organs are invariably present in the same positions on each side: a single *supraventral* a short distance above, and slightly anterior to, the ventral fin base; a single *supra-anal* a short distance above the anus and slightly in advance of the origin of anal fin; a single *postanal* located immediately above the posterior one-third of anal fin base.

It is also typical to find a luminous organ associated with each of the branchiostegals, particularly the upper three. These are all present in *Sagamichthys*. There is also an additional and similar photophore associated with the suboperculum.

Both *Searsia* and *Sagamichthys* have a luminous organ extending along the lower ray of each pectoral fin.

It seems obvious that such a complete agreement in a system of luminous organs of such complexity, involving so many individual units and locations, and so distinct from the patterns of other luminous fishes, must be taken as evidence of a very close systematic relationship, with specially significant ties between *Sagamichthys* and *Searsia* itself, and thus with the family Searsidae, to which the new genus also belongs by the presence of the shoulder organ.

While the development of the photophores characteristic of *Searsia* and nearly related forms has reached its most advanced and most complete stage in *Sagamichthys*, the new genus nevertheless also seems the most primitive of the genera in many other respects. The squamation of the head may itself represent a primitive character, as does the transparent, scaleless "window" over the pineal region of the skull. The width of the upper branchiostegals, which functionally join the series of the opercular bones rather than the lower branchiostegals, is proportionally considerably greater than in any other searsid, and their form more plate-like. There is virtually no dermal margin extending the gill cover backward beyond the gill cover skeleton. The dentition of the premaxillaries consists only of the

single series of small, uniform, downward-directed teeth that is normal for fishes of this type, with a complete lack of the specialized, enlarged, and forward-directed tusks that are so prominent in *Searsia*, *Persparsia*, and *Holtbyrnia* spp. On the other hand *Sagamichthys*

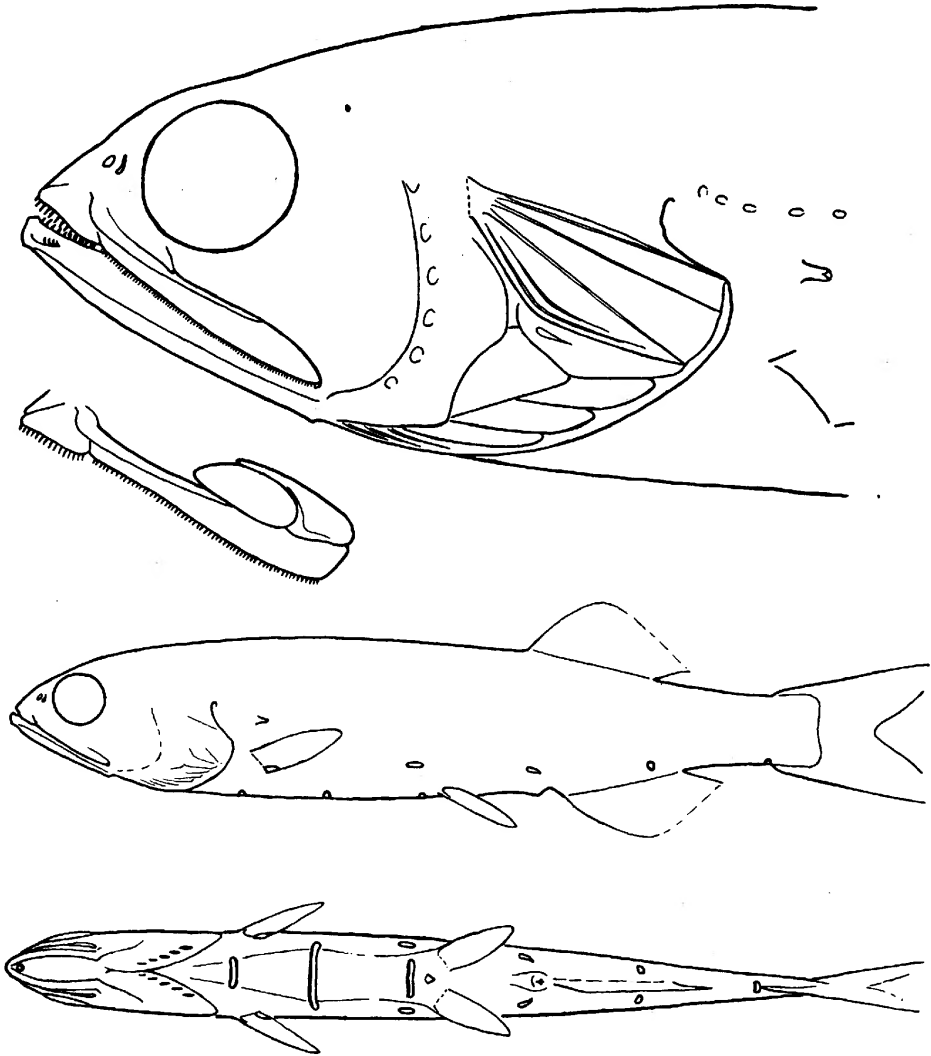


FIG. 1. *Sagamichthys abei*, new species. (Top) Details of head with opercular skeleton partly exposed, and with exposed upper jaws shown separately immediately below. (Bottom) Lateral and ventral views of entire fish.

does have the short external series of teeth below the normal dentition of the lower jaw characteristic of *Holtbyrnia*, subgenus *Mentodus*, but the long, narrow, and oblique opercle again sets it apart.

By this combination of primitive and advanced features *Sagamichthys* helps to confirm the natural unity of various genera of the family Searsidae at the same time as its own position within the family remains rather strikingly isolated.

Sagamichthys abei, new species

Bathytroctes rostratus TANAKA, 1910, pp. 251-252, fig. 1 (*non* Günther, *nec* synon.).

TYPE SPECIMEN: No. 47820, collections of the Zoological Institute, University of Tokyo.

The general appearance of the species is adequately shown and accounted for in the accompanying illustrations and in the definition and discussion of the genus. Only the specific counts and measurements need to be added here.

Length of type, without caudal fin, 210 mm. Proportions in per cent of the length without caudal fin: Head, 27.8 per cent. Snout, 4.5. Orbit, 6.6. Over-all length of upper jaws, 13.8. Length of premaxillary, 4.3. Over-all length of supramaxillaries, 7. Maximum over-all width of upper jaw, including supramaxillaries, 3.5. Length of lower jaw, 14.5. Distance from snout to top of preopercle, 14.6. Distance from snout to top of gill slit, 25.2. Interorbital width, 7.1. Width of skull, about 8.7. Snout to pectorals, 30. Length of pectorals, 11+. Width of pectoral fin base, 3.6. Snout to ventral fins, 54.5. Length of ventral fins, 10.6. Base of anterior ventral fin ray: to center of anus, 13.9; to origin of anal fin, 15.3. Snout to dorsal fin, 65. Base of dorsal fin, 16.5. Snout to anal fin, 69.5. Base of anal fin, 15.6. Greatest depth of body, 20.2. Least depth of caudal peduncle, 8.7. Longest gill raker, 1.9. Longest pyloric caecum, about 6.7.

Snout to jugular luminous organ, 30.5 per cent. Length (transversely) of jugular organ, 3.7. Snout to thoracic organ, 40.7. Transverse length of thoracic organ, 8.3. Snout to abdominal organ, 52.2. Transverse length of abdominal organ, 4.8.

The length of the stomach measured from the cross section at the anterior point of the liver equals about 15.5 per cent of the length without caudal fin, exceeding the length to the axil of the pyloric arm by about 4.8 per cent of L, with the caecal portion of the stomach extending beyond the pyloric arm by about 3.4 per cent of L. The pyloric caeca, of which there are 15, may be regarded as simple, but with a tendency for some to be arranged in pairs that might be interpreted as division at the base. The pair formed by the eleventh and

twelfth caeca is imbricated over the pair formed by the thirteenth and fourteenth so as more or less to hide the latter from lateral view.

There are 48 pores in the lateral line, and about 109 scales in a longitudinal series. Fourteen to 15 scales transversely between lateral line and origin of dorsal fin, and 14 between lateral line and anal fin.

The outer gill arch has 25 gill rakers, of which eight are on the upper limb.

D, $18\frac{1}{2}$; A, $16\frac{1}{2}$; P, 14; V, 9; Br, 6.

Known only from the type taken at Yodomi, in Sagami Bay, Japan, on April 22, 1909.

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